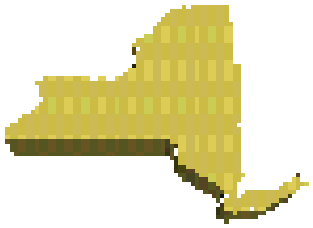

Federal-State Partnership for Enhanced Understanding of Air Quality and Health Relationships

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Air Quality Pilot Objectives

- Facilitate use of Air Quality Planning Applications through Grid Technology (NC, NY, WRAP)
- Prototype Air Quality Forecasting for PM 2.5 (NY)
- Assist Surveillance of Human Health-Air Quality Relationships (NY)

Success through Partnerships

- Internal EPA partnerships
  - Office of Environmental Information (OEI) – Information Infrastructure
  - Office of Air and Radiation (OAR) - regulatory policy, forecasting, and data assimilation efforts
  - Region 2 – direct interaction with States, implementation of policy
- External EPA partnerships
  - NOAA - weather, air quality, forecasting, and operational satellite program expertise
  - NASA/NOAA – satellite data to enhance data richness of air quality information
  - DOE - advanced IT capabilities to enhance air quality modeling
  - CDC - approaches to explore potential linkages between air quality and human health

Partnering with NY:
Air Quality Forecasting

- NOAA/EPA to provide remote access to daily air quality forecast guidance for Ozone
- NY State will use to develop local forecasts and inform public/personal decisions about mitigation actions
- NY State, supported by the Agency partners, will apply CMAQ to prototype predictions of PM 2.5 and other pollutants—pushing the state of the science
- Satellite measurements of aerosol optical depth by NASA/NOAA will be evaluated for potential to improve the quality of the air quality modeling and forecasting of PM 2.5

Partnering with NY: Environmental Public Health Tracking

- NY, in collaboration with the Centers for Disease Control (CDC), to investigate potential relationships between air quality and human health data
  - EPA (ORD and OAR) are working with CDC and States to provide improved predictions of air pollutant concentrations
  - These data could potentially be used to explore possible relationships between air quality and human health

Spatial Prediction Using Combined Sources of Data

- Air Monitoring Data
  - A range of temporal scales available *(aerosols – weekly or 1 in every 3 days, ozone – hourly)*
  - Sparse networks (number of monitors range from about 100 across U.S. for aerosols to 1000s for ozone)
  - Monitors are usually sited in either urban or rural areas only, depending on the nature of the network
    - *Many rural areas have no monitors for ozone*
    - *For aerosols, STN network is urban, CASTNet is rural, and IMPROVE is in protected Class I protected areas*
  - Kriging prediction errors may be arbitrarily large in non-monitored areas
  - Data quality and representativeness is not uniform across different networks

Spatial Prediction Using Combined Sources of Data (continued)

- Air Pollution Numerical Model Output
  - High spatial and temporal resolution (36 km horizontal grid or less, 1 hour time steps)
  - Location dependent bias due to input uncertainties (e.g., emissions, meteorology)
- Satellite Data
  - High spatial and temporal resolution (e.g., aerosol retrievals ranging from 1 – 10 km scale horizontal grid, 7 orbits per day)
  - Provides integrated columnar information (vs. surface concentrations)
  - Algorithm uncertainties: Derived chemical species values from primarily radiative properties
  - Experimental uncertainties: Environmental Noise (e.g., clouds contamination); Calibration issues

Solution: Combining Different Sources of Spatial Information should lead to improved maps of air quality

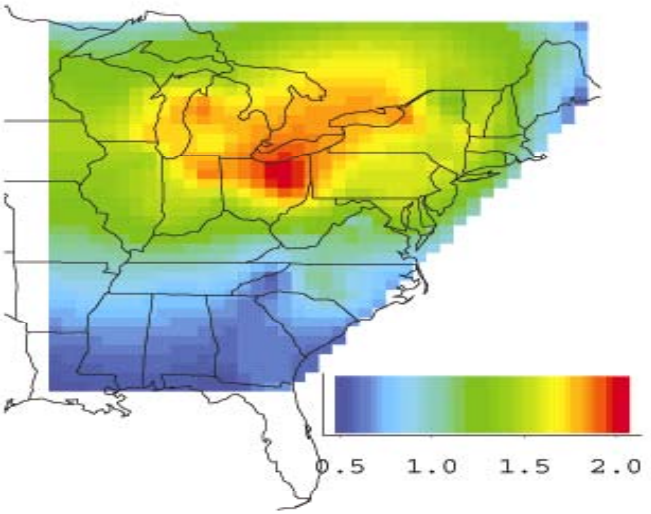
Modeling Issues:

- Must model measurement uncertainties associated with each source
- Compensate for statistical differences between variability of model output (areal average) and monitoring data (point measurements)
- Take advantage of dense model output and accuracy of monitoring data

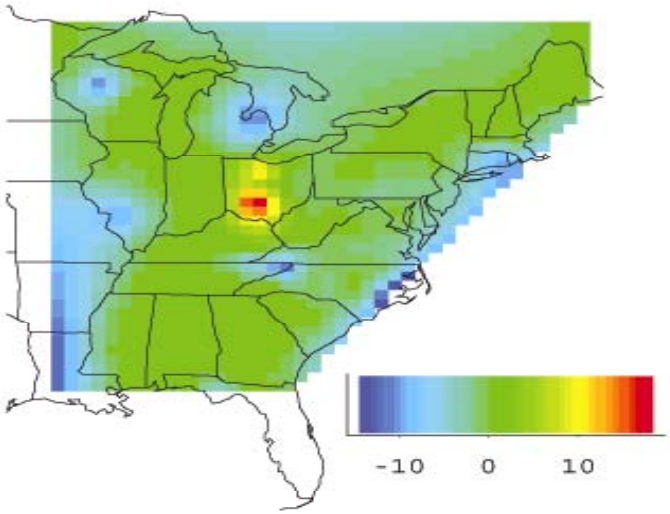
Solution: Combining Different Sources of Spatial Information should lead to improved maps of air quality (continued)

- Predictive Advantages:
  - More accurate predictions of pollution gradients
  - Allows improved capability to validate output of numerical models
  - Allows for better estimation of error associated with final spatial map

Prediction with Combined Sources



Spatial map of nitrate deposition using both NADP and CASTNET Data



Difference in nitrate deposition from NADP+CASTNET Data vs. NADP Data Alone

Enhancing State & Regional Air Quality Applications

Enhanced Tools
Optimized CMAQ
Satellite Data
(w/NASA & NOAA)

Enhanced IT
Grid Services
Science Subnet

Enhanced Air Quality Applications

Traditional Applications
State Implementation Plans
Policy Analysis

Prototype Applications
Air Quality Forecasting (w/NOAA)
Public Health Tracking (w/CDC)

Accountability
Detecting and Tracking Progress (W/States)

Summary

- Partnerships across Federal and State agencies are significantly advancing our technical capabilities in addressing air quality and health Issues.

- The success of these pilot projects has pioneered partnership approaches for the future.